Dragon Products Company, LLC
Knox County
Thomaston, Maine
A-326-77-9-A

Departmental
Findings of Fact and Order
New Source Review
NSR #9

FINDINGS OF FACT

After review of the air emissions license application, staff investigation reports, and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 38 Maine Revised Statutes Annotated (M.R.S.A.), Section 344 and Section 590, the Maine Department of Environmental Protection (the Department) finds the following facts:

I. REGISTRATION

A. Introduction

FACILITY	Dragon Products Company, LLC
LICENSE TYPE	06-096 CMR 115, Minor Modification
NAICS CODES	32731
NATURE OF BUSINESS	Cement Manufacturing
FACILITY LOCATION	U.S. Route 1, Thomaston, Maine

B. New Source Review License Description

Dragon Products Company, LLC (Dragon) has submitted an application to include at the facility a slag dryer system to remove excess moisture from granulated blast furnace slag. The system, designated the Slag Dryer, consists of a slag dryer burner and conveying equipment. The burner will fire natural gas. Emissions from this system are to be controlled using a baghouse.

C. Emission Equipment

The following equipment is addressed in this New Source Review (NSR) license:

Fuel Burning Equipment

Equipment	Max. Input Capacity (MMBtu/hr)	Maximum Firing Rate	Fuel Type, % sulfur by weight	Dates of...		Stack #
				Manufacture	Installation	
F651: Slag Dryer Burner	75.6	75,600 ft^3/hr	Natural gas, negligible	2015	2016	#1

Process Equipment

Equipment	Production Rate	Pollution Control Equipment	Stack #
F650: Slag Dryer	100 tons/hour of slag	Dust collector	#1
F652: Discharge Conveyor			

D. Application Classification

The application for the addition of the Slag Dryer, equipped with a new 75.6 MMBtu/hour burner, does not violate any applicable federal or state requirements and does not reduce required monitoring, reporting, testing, or recordkeeping. This application includes a Best Available Control Technology (BACT) analysis performed per New Source Review.

The modification of a major source is identified as major or minor based on whether or not expected emissions increases exceed the "Significant Emission Increase" levels as given in *Definitions Regulation*, 06-096 Code of Maine Rules (CMR) 100 (as amended).

Dragon has requested a maximum dryer throughput limit of 75,000 tons per year.

The emissions increases of criteria pollutants from fuel combustion and material processing in the Slag Dryer with the requested 75,000 tons per year dryer throughput limitation are less than the corresponding significant emissions increase levels, as presented in the following table.

Pollutant	Projected Emissions Increases (ton/year)	Significant Emissions Increase Levels (ton/year)
PM	--	25
PM_{10}	--	15
$PM_{2.5}$	--	10
SO_2	0.02	40
NO_x	2.84	40
CO	2.38	100
VOC	0.16	40
CO_2e	< 75,000	75,000

Note: The above numbers are for the Slag Dryer only. None of the other equipment at the facility is affected by this NSR license.

Therefore, the change at the facility represented in this NSR license is determined to be a minor modification under *Minor and Major Source Air Emission License Regulations* 06-096 CMR 115 (as amended) since the changes being made are not addressed or prohibited in the Part 70 air emission license. An application to incorporate the requirements of this NSR license into the Part 70 air emission license is required to be submitted no later than 12 months from commencement of the requested operation. Dragon submitted such Part 70 license amendment application concurrently with this NSR license application.

II. NSR LICENSE DESCRIPTION

Dragon has proposed to install and operate a 75.6 MMBtu/hour, 100 tons/hour dryer to remove moisture from granulated blast furnace slag (slag). Slag is a non-hazardous byproduct of the steel manufacturing process. Dragon processes coarse, unground slag in the existing cement finish mill for sale to the concrete ready-mix market. The Slag Dryer will be used to remove excess moisture from the coarse slag prior to introduction into the finish mill system. Results of analyses of the material confirm it is non-hazardous, and off-gas testing has been conducted which confirms no total hydrocarbon (THC) emissions will be generated from the heating of slag in the Slag Dryer.

The Slag Dryer, a horizontal, rotating drum, will have a burner at one end; wet slag material will be introduced at the other end and will move through the dryer countercurrently to the exhaust gases. The unit is to be located in the building known as the Old Mill Room. The system's burner has the option of burning either liquid or gaseous fuels to provide heat for drying the slag, but Dragon will fire natural gas in the unit. The unit will utilize a single, dedicated baghouse for dust collection for the control of particulate matter (PM) emissions from the process.

The dryer system utilizes a 75.6 MMBtu/hour industrial burner manufactured by Eclipse/Hauck to generate heat to remove moisture from the slag. Based on maximum production hours at capacity with the licensed throughput limitation, Dragon estimates the unit's annual fuel use of approximately 56.7 MMscf of natural gas.

III. BEST PRACTICAL TREATMENT (BPT)

A. Introduction

In order to receive a license, the applicant must control emissions from each unit to a level considered by the Department to represent Best Practical Treatment

(BPT), as defined in *Definitions Regulation*, 06-096 CMR 100 (as amended). Separate control requirement categories exist for new and existing equipment as well as for those sources located in designated non-attainment areas.

BPT for new sources and modifications requires a demonstration that emissions are receiving Best Available Control Technology (BACT), as defined in 06-096 CMR 100. BACT is a top-down approach to selecting air emission controls considering economic, environmental and energy impacts.

B. BACT Determination

Under 06-096 CMR 115(4)(A)(4)(d), BACT is required for all regulated pollutants, fugitive as well as stack emissions, from each emissions unit to be constructed, reconstructed, or modified by a project. The following is a summary of the BACT determination for the Slag Dryer, by pollutant.

1. Particulate Matter (PM, PM_{10}, and $PM_{2.5}$)

   Particulate matter emissions from the Slag Dryer potentially come from both fuel combustion and the slag material being dried. Units firing fuels with low ash content and high combustion efficiency exhibit low particulate matter emissions from combustion. The most stringent PM, PM_{10}, and $PM_{2.5}$ control method demonstrated for combustion units of this size and type is the use of low ash fuel such as natural gas. The use of a dedicated baghouse for dust collection for the control of particulate matter emissions from the drying process, with a rated collection efficiency of 99.9% and corresponding particulate matter emission rate of 0.01 grains per dry standard cubic foot (gr/dscf), represents BACT for PM, PM_{10}, and $PM_{2.5}$ emissions from this process.

2. Sulfur Dioxide (SO_2)

   Sulfur dioxide from a Slag Dryer is formed from the oxidation of sulfur in the fuel combusted in the dryer. The options to control SO_2 emissions from fuel combustion include low sulfur fuel and add-on treatment of the combustion exhaust gases.

   Based on review of state and federal resources and other air emission licenses issued by the Department, add-on controls for SO_2 emissions from units of similar input capacity firing natural gas were not identified. Due to the inherently low sulfur content of natural gas, additional SO_2 control from natural gas combustion is not economically justifiable.

   The Department finds good combustion controls and the firing of natural gas constitute BACT for SO_2 emissions from the Slag Dryer.

3. Nitrogen Oxides (NO_x)

The formation of NO_x is determined by the interaction of chemical and physical processes occurring within the flame zone of the dryer. Thermal NO_x arises from the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) in the combustion air. The major factors influencing thermal NO_x formation are temperature, concentrations of combustion gases in the inlet air, and residence time within the combustion zone. Fuel NO_x is formed by the oxidation of fuel-bound nitrogen. NO_x formation can be controlled by adjusting the combustion process and/or installing post-combustion controls.

Options for controlling NO_x emissions from the Slag Dryer include combustion control, conventional selective catalytic reduction (SCR), regenerative selective catalytic reduction (RSCR), selective non-catalytic reduction (SNCR), flue gas recirculation (FGR), and Low-NO_x Burners.

SCR and RSCR

The exhaust gas from the Slag Dryer system is expected to be less than 400 °F, outside of the optimal temperature range for SCR systems. In addition, a review of the U. S. EPA's RACT/BACT/LAER Clearinghouse (RBLC) database indicates no precedent for the use of either conventional or regenerative SCR systems for this type of system. Therefore, the use of SCR or RSCR is not considered as available NO_x control technology for the proposed Slag Dryer.

SNCR

SNCR add-on control technology describes a process by which NO_x is reduced to molecular nitrogen and water by injecting an ammonia or urea spray into the post-combustion area of the unit. Once injected, the urea or ammonia decomposes into NH_3 or NH_2 free radicals, which react with NO_x molecules in the flue gases, resulting in reaction products of nitrogen (N_2) and water (H_2O). This technology is considered a selective chemical process because, within a specific temperature range, the reduction reactions to convert NO_x to the two resulting compounds are favored over reactions with other flue gas components. Although other operating parameters such as residence time and oxygen availability can significantly affect performance, temperature is one of the most prominent factors affecting SNCR performance. Based on manufacturer's specifications and literature searches, the minimum temperature for effective operation of a SNCR system is 1,650 °F. Below the optimal SNCR operating temperature, the desired reactions will not occur, and unreacted ammonia will either be emitted as ammonia slip, or it will react with SO_3 to form ammonium salts.

A review of the RBLC database does not show the use of an SNCR system for this type of process. In addition, the exhaust gas temperatures of the proposed

Slag Dryer are well below the optimum temperature for SNCR system performance, so additional fuel burning to raise the flue gas temperature for SNCR treatment would be required.

Low-NO_x Burners
Low-NO_x Burners are considered an effective means for the control of NO_x emissions from the combustion of natural gas. Therefore, this technology is being retained for further consideration.

Evaluation of Most Effective Control Option (Impacts Analysis)
The use of SNCR technology is not economically justified, considering the relatively low level of expected NO_x emissions without controls (less than 3 tons/year), the control effectiveness of approximately 60% NO_x removal using this technology, and the calculated cost of installation and operation of an SNCR system of $26,070 per ton of NO_x reduction. The use of Low-NO_x burners also have a relatively low level of expected control of NO_x emissions and high calculated cost of $19,202 per ton of NO_x reduction. Both of these control options were put forth by the facility as not cost effective given the negligible impact of the dryer on air quality and the relatively low NO_x emissions expected from the Slag Dryer.

NO_x BACT Determination
The Department has determined that the combustion of natural gas utilizing good combustion practices and an emission rate of 0.1 lb/MMBtu is BACT for NO_x emissions from the Slag Dryer.

4. Carbon Monoxide (CO) and Volatile Organic Compounds (VOC)

The combustion of natural gas in the Slag Dryer results in low levels of CO and VOC (0.084 and 0.0055 lb/MMBtu, respectively). In addition, the acceptance of a license limitation of 75,000 tons per year of slag throughput results in low levels of CO and VOC (2.38 and 0.16 tons/year, respectively). Based on a review of the RBLC database, BACT for CO and VOC emissions from these types of operations is considered to be implementation of good combustion practices. Therefore, no further analyses are required for CO and VOC emissions from the Slag Dryer.

5. Greenhouse Gases (GHG)

Greenhouse gases are considered regulated pollutants as of January 2, 2011, through 'Tailoring' revisions made to EPA's *Approval and Promulgation of Implementation Plans,* 40 CFR Part 52, Subpart A, §52.21 *Prevention of Significant Deterioration of Air Quality* rule. Greenhouse gases, as defined in 06-096 CMR 100 (as amended), are the aggregate group of the following gases: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons,

perfluorocarbons, and sulfur hexafluoride. For purposes of licensing, GHG are calculated and reported as carbon dioxide equivalents (CO_2e).

Emissions of GHG from the Slag Dryer and similar units result from combustion of hydrocarbons in fossil fuels such as natural gas. Control techniques and measures available to mitigate greenhouse gas emissions from the Slag Dryer include operation and maintenance practices to maximize combustion efficiency, fuel switching, and carbon capture and storage. Carbon capture and storage is not a proven technology on a commercial basis and is not economically viable. Dragon is designing the unit to fire natural gas, and there are no other fuels to switch to which would generate lower GHG emissions.

Based on the above information, the Department finds that good operation and maintenance practices to maximize combustion efficiency while firing natural gas is BACT for GHG emissions from the Slag Dryer.

C. Emission Limits

Emission limits for the Slag Dryer firing natural gas are based the following emission factors:

Pollutant	Emission Factor	Source of Emission Factor
PM, PM_{10}, $PM_{2.5}$	0.12 lb/MMBtu 7.6 lb/MMscf 0.01 gr/dscf	06-096 CMR 103(2)(B)(1)(a) AP-42, Table 1.4-2 (7/98) After baghouse controls
SO_2	0.6 lb/MMscf	AP-42, Table 1.4-2 (7/98)
NO_x CO	100 lb/MMscf 84 lb/MMscf	AP-42, Table 1.4-1 (7/98)
VOC	5.5 lb/MMscf	AP-42, Table 1.4-2 (7/98)
Visible Emissions	--	06-096 CMR 101

The BACT emission limits for the Slag Dryer firing natural gas are the following:

Unit	PM, lb/hr	PM_{10}, lb/hr	$PM_{2.5}$, lb/hr	SO_2, lb/hr	NO_x, lb/hr	CO, lb/hr	VOC, lb/hr
Slag Dryer 75.6MMBtu/hour firing natural gas	Negligible (based on the AP-42 emission factor for natural gas combustion and a baghouse control efficiency of ≥ 99.9%)			0.05	7.56	6.35	0.42

Visible emissions from the Slag Dryer shall not exceed 10% opacity on a six-minute block average basis. Dragon shall take corrective action if visible emissions from the baghouse exceed 5% opacity.

D. Control Equipment

Dragon shall maintain and operate a baghouse to control emissions during operation of the Slag Dryer. Dragon shall maintain records of all routine and non-routine maintenance conducted on the baghouse. Such records shall contain the location, date, nature of maintenance or failure, and maintenance action taken or action taken to correct the failure. [06-096 CMR 115, BPT]

E. Periodic Monitoring

Periodic monitoring for the Slag Dryer shall include recordkeeping of slag throughput, both on a monthly and 12-month rolling total basis. These records shall be based on the quantity of product exiting the Slag Dryer.

F. NESHAP

Federal regulation 40 CFR Part 63, Subpart LLL, *National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry*, specifies requirements for emissions of hazardous air pollutants from the Portland cement manufacturing industry. According to the definitions in Subpart LLL and as confirmed by a letter from EPA to the facility dated August 14, 2014, the Slag Dryer is considered a finish material dryer. Because the Slag Dryer is only to be used to dry slag, a product used in concrete, and not used to dry a material used in the production of portland cement, the unit is not subject to Subpart LLL.

G. Annual Emissions

Dragon is licensed for the following annual emissions, based on a 12-month rolling total. The tons per year limits were calculated based on 8760 hours/year operation for PM emissions from the Kiln System and Clinker Cooler; previous tpy limits for SO_2, NO_x, CO, and VOC from the Kiln System and Clinker Cooler (established in the licensing of the wet-to-dry process modification); 100 hours/year operation for each generator; and a maximum annual throughput of 75,000 tons of slag through the Slag Dryer:

Total Licensed Annual Emissions for the Facility
Tons/year
(used to calculate the annual license fee)

	PM	PM_{10}	SO_2	NO_x	CO	VOC	NH_3
Kiln System	41.2	41.2	306.6	1,533.0	843.2	57.5	32.9
Clinker Cooler	40.1	40.1	--	--	--	--	--
Emergency Generator	0.02	0.02	0.0003	0.83	0.18	0.07	--
Quarry #1 Pump	0.01	0.01	0.0001	0.37	0.08	0.03	--
Kiln Emergency Drive Engine	0.01	0.01	0.0001	0.23	0.05	0.02	--
Slag Dryer	--	--	0.02	2.84	2.38	0.16	--
Total TPY	**81.3**	**81.3**	**306.6**	**1,537.3**	**845.9**	**57.8**	**32.9**

IV. AMBIENT AIR QUALITY ANALYSIS

Dragon previously submitted an ambient air quality analysis demonstrating that emissions from the facility, in conjunction with all other sources, do not violate ambient air quality standards (see license A-326-71-U-A/R, issued on November 19, 2002). An additional ambient air quality analysis is not required for this NSR License.

ORDER

Based on the above Findings and subject to conditions listed below, the Department concludes that the emissions from this source:

- will receive Best Practical Treatment,
- will not violate applicable emission standards,
- will not violate applicable ambient air quality standards in conjunction with emissions from other sources.

The Department hereby grants NSR License A-326-77-9-A pursuant to the preconstruction licensing requirements of 06-096 CMR 115 and subject to the specific conditions below.

Severability. The invalidity or unenforceability of any provision of this License or part thereof shall not affect the remainder of the provision or any other provisions. This NSR License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

SPECIFIC CONDITIONS

(1) Slag Dryer F650

A. Dragon shall process a maximum of 75,000 tons per year of slag in the Slag Dryer, based on the quantity of product exiting the Slag Dryer. Records shall be maintained documenting compliance with this limit on a monthly and 12-month rolling total basis. [06-096 CMR 115, BPT]

B. Emission limits for the Slag Dryer firing natural gas and with baghouse control of emissions are the following:

Unit	PM, gr/dscf	PM, lb/hr	PM_{10}, lb/hr	$PM_{2.5}$, lb/hr	SO_2, lb/hr	NO_x, lb/hr	CO, lb/hr	VOC, lb/hr
Slag Dryer 75.6MMBtu/hour firing natural gas	0.01	Negligible			0.05	7.56	6.35	0.42

Visible emissions from the Slag Dryer shall not exceed 10% opacity on a six-minute block average basis. Dragon shall take corrective action if visible emissions from the baghouse exceed 5% opacity. [06-096 CMR 101]

C. Dragon shall maintain and operate a baghouse to control emissions during operation of the Slag Dryer. Dragon shall maintain records of all routine and non-routine maintenance conducted on the baghouse. Such records shall contain the location, date, nature of maintenance or failure, and maintenance action taken or action taken to correct the failure. [06-096 CMR 115, BPT]

DONE AND DATED IN AUGUSTA, MAINE THIS 10th DAY OF May , 2016.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Heather Parent for Paul Mercer
PAUL MERCER, COMMISSIONER

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: February 22, 2016
Date of application acceptance: February 25, 2016

Date filed with the Board of Environmental Protection:

Filed
MAY 10 2016
State of Maine
Board of Environmental Protection

This Order prepared by Jane E. Gilbert, Bureau of Air Quality.